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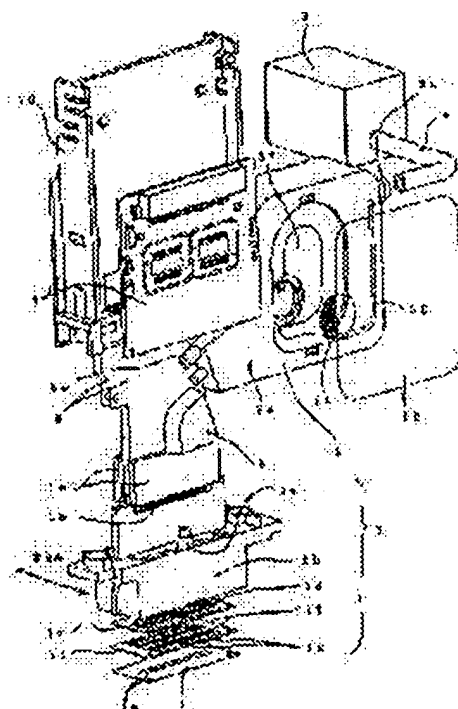
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(54) INK JET TYPE RECORDER**(57)Abstract:**

PROBLEM TO BE SOLVED: To raise reliability and wake compact by a method wherein two or more lead openings are formed integrally with one pressure absorber, and a circuit board is installed vertically to an ink jet type recording head.

SOLUTION: A damper 5 composed of a damper frame 5a wherein a lead opening 5d connected to an ink tank 3 via a tube 4, a pressure absorbing chamber 5f connected to the lead opening 5d with a channel 5g, the channel 5 connected to the pressure absorbing chamber 5f, and a plurality of lead opening 5e connected to the channel 5h are formed, a flexible damper film 5b, and a filter 5c arranged between the pressure absorbing chamber 5f and the channel 5h, is connected to an ink jet head.

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CLAIMS

[Claim(s)]

[Claim 1] The ink jet type recording device which is an ink jet type recording device which carried in carriage the ink jet head by which two or more nozzles which carry out the regurgitation of the ink droplet were installed successively, and the pressure absorber which consists of a pressure absorption frame and flexible pressure absorption film, and is characterized by preparing two or more derivation openings of said pressure absorber.

[Claim 2] The ink jet type recording device according to claim 1 characterized by connecting with the supply pipe with which said derivation opening had an include angle to the successive installation direction of a nozzle train, and was installed in the head frame.

[Claim 3] The ink jet type recording device according to claim 1 characterized by containing the circuit board between said derivation openings.

[Claim 4] The ink jet type recording device characterized by having said two or more circuit boards to one ink jet head.

[Claim 5] The ink jet type recording device according to claim 1 characterized by the width of face of said pressure absorber being the width of face of said ink jet head, and below equivalent.

[Claim 6] The ink jet type recording device according to claim 1 characterized by the cross-sectional area of said derivation opening which has more than one differing, respectively.

[Claim 7] The ink jet type recording device according to claim 1 characterized by for said pressure absorber having two or more inlets, two or more pressure absorption rooms, and two or more derivation openings, and supplying two or more ink separately.

[Claim 8] The ink jet type recording device according to claim 1 characterized by having arranged the filter which has corrosion resistance in the passage of said pressure absorber.

[Claim 9] Claim 1 characterized by forming an inlet, a pressure absorption room, and derivation opening in said pressure absorption frame by one thru/or an ink jet type recording device given in 8 any 1 terms.

[Claim 10] The ink jet type recording device according to claim 9 characterized by said pressure absorption frame forming with injection molding of resin by one.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the equipment (a damper is called henceforth) which absorbs in a detail the pressure of the ink generated with the acceleration at the time of the configuration of an ink jet head, and migration of carriage about the ink jet type recording apparatus which breathes out an ink droplet to a record medium and forms a record image.

[0002]

[Description of the Prior Art] In an ink jet type recording apparatus, in case carriage moves, the pressure which was proportional all over the passage from an ink tank to an ink jet head at the product of the acceleration of carriage, the die length of the passage from an ink tank to a head, and the specific gravity of ink occurs in the supply pipe section of an ink jet head. If this pressure gets across to the nozzle of a direct ink jet head, an ink droplet will change and poor printing [printing], such as turbulence, spilling, and a dot omission, will occur. Two approaches have been conventionally taken as this cure. One is the approach of forming an absorber in the middle of the passage from an ink tank to an ink jet head. Another is the approach of carrying an ink tank in carriage and making small effect of the acceleration by migration of carriage by making ink passage into short die length. When there is a problem that only the limited amount of ink can be carried in the method which fixes an ink tank to a head directly and extensive printing and high-speed printing is considered, there is a limitation.

[0003] Drawing 6 and drawing 7 are the ink jet type recording devices of the conventional example which used the absorber which is another approach, drawing 6 is a decomposition perspective view and drawing 7 is a sectional view. This absorber (100) consists of an absorber frame (101) and a flexible absorber film (102). The ink inlet connected to an absorber frame (101) with the tube from the ink tank which is not illustrated (103), Derivation opening (105) connected to the supply pipe (104) of a recording head is prepared. And a pressure absorption room (107) is formed in a part of passage (106) which carried out the smooth form where this inlet (103) and derivation opening (105) were connected to one side or both sides of a damper frame (101), and this passage (106). the members (a spring, network, etc.) which inhibit the sag of a damper film (102) in the opposite location of the pressure absorption room (107) -- allotting -- a pressure absorption room (107) -- a wrap -- it was what carries out heat welding of the flexible damper film (102) like at a damper frame (101).

[0004] An ink jet type recording device aims at improvement in the speed, and is gathering processing speed sharply. In order to solve the problem generated in order to consume a lot of ink that ink supply is insufficient, it has two or more supply pipes. With the conventional technique, two supply pipes are branched from one damper (100) using distribution passage (108). This distribution passage (108) consists of two components of a frame (109) and a needle (110), and they are assembled by ultrasonic welding. In case the rubber bush (111) is used for connection of distribution passage (108) and a supply pipe (104) and distribution passage (108) is fixed to a head frame (112), by compressing a rubber bush (111), the seal was carried out and ink leakage is prevented. Moreover, the connection between a damper (100) and distribution passage (108) has taken the seal by pressing a needle (110) fit using an O ring (114). Space is between distribution passage (108) and an ink jet head (112), and the circuit board (113) for driving the vibrator which is an actuator for flying an ink droplet there is horizontally arranged to a nozzle plate side. In order to arrange a nozzle (115) to high density, it consists of a nozzle train of two trains, and is alternate. Although vibrator (116) is electrically connected to the circuit board (113) using a film substrate (117), vibrator (116) has structure which bends a film substrate (117) on both sides for 2 ***** reason, and is connected to the circuit board (113).

[0005]

[Problem(s) to be Solved by the Invention] In order to secure the ink amount of supply, a current ink jet head is increasingly equipped with two or more supply pipes, as the conventional technique explained. In the Prior art, it was whether to connect with the supply pipe of an ink jet head from one damper by the approach by the distribution passage which has two or more derivation openings with the approach of supplying ink, or another components in one feed hopper, the approach of using two or more dampers, or a damper to the tube on the structure of a damper. Two or more use of a damper cannot be said to be a good proposal from the problem of magnitude or the number of erectors, either. Since distribution passage joins two components by ultrasonic welding and makes passage, a welding may carry out crushing of it, since ** is not smooth, stagnation of air bubbles may start it, and short supply may generate it. Moreover, since the approach of connecting with a supply pipe by the tube has the high permeability of the badness of assembly nature, a steam, or gas, the viscosity of ink may go up and the poor regurgitation may occur. Moreover, in order that an absorber to a supply pipe may tie by the tube, even if it absorbs pressure fluctuation with an absorber, pressure fluctuation will be vibrated and carried out within a previous tube from there at the time of the acceleration and deceleration of carriage. Then, it is important that it is the structure which can manufacture the damper equipped with two or more derivation openings by one.

[0006] Another technical problem is magnitude. The class of the ink jet type recording apparatus with which colorization progresses of ink to be used also increases, and its number of ink jet heads is also increasing in connection with it. It is fixed to carriage, and an ink jet head forms a record image in discharge and a record medium for an ink droplet, making the carriage reciprocate. For example, in the case of the color ink jet type recording apparatus which uses the ink of six colors, six ink jet heads are used, and the ink jet head is put in order and attached in carriage. Therefore, carriage becomes very large. Moreover, since the product of an ink jet type recording apparatus serves as the configuration where the migration space of carriage was secured, the magnitude of carriage is the important factor which determines the magnitude of a product. In order to offer a compact product, it is necessary to make small width of face of an ink jet head, and it is necessary to arrange the ink jet head in high density. With the conventional technique, the width of face of an ink jet head was decided by

the magnitude of the circuit board. Although width of face of an ink jet head body can be made small if the perpendicular direction of an ink jet head can be equipped with the circuit board, it is impossible for a damper and distribution passage to interfere and to equip with the circuit board perpendicularly. Moreover, the width of face of a damper is also a problem. Though the magnitude of the circuit board can be avoided, if the magnitude of an absorber is larger than the width of face of an ink jet head, it will lead to enlargement of carriage.

[0007] Then, the place which this invention is for solving such a trouble, and is made into the purpose is to offer compactly a reliable absorber and the ink jet type recording device in which compact arrangement is possible.

[0008]

[Means for Solving the Problem] The ink jet type recording apparatus of this invention is an ink jet type recording apparatus which carried in carriage the ink jet head by which two or more nozzles which carry out the regurgitation of the ink droplet were installed successively, and the pressure absorber which consists of a pressure absorption frame and flexible pressure absorption film, and is characterized by preparing two or more derivation openings of said pressure absorber.

[0009] Moreover, it is characterized by installing the circuit board in the perpendicular direction of an ink jet head.

[0010]

[Embodiment of the Invention] A drawing is used for below and the example of this invention is explained to it at a detail.

[0011] Drawing 1, drawing 2, and drawing 3 are ink jet type recording devices which are one example of this invention. Drawing 1 is a decomposition perspective view and a sectional view in which in drawing 2 a perspective view and drawing 3 (a) show a side elevation, and drawing 3 (b) shows passage.

[0012] The outline of the regurgitation of ink is explained first. The ink jet head (2) consists of a nozzle plate (1), a spacer (11), a diaphragm (1c), vibrator (1b), a vibration-deadening plate (1e), a head frame (2b), a film substrate (6), the circuit board (7), and a holder substrate (10). Adhesion immobilization of what carried out the laminating of a pressure generating room (1f), and the spacer (11) with which the reservoir (1g) was formed and a diaphragm (1c) to the shape of sandwiches is carried out at the head frame (2b). [the nozzle plate (1) which has a nozzle (1a), and] (1b) is the vibrator equipped with longitudinal-oscillation mode, and by considering as a laminating mold, it is constituted so that a big variation rate may occur in low applied voltage. The free end of this vibrator (1b) is being fixed by the island-like height (1d) and adhesives which were formed on the diaphragm (1c). The metal diaphragm frame has fixed the diaphragm (1b) on the resin film, and adhesion immobilization of the diaphragm frame part is carried out at the head frame (2b). Moreover, the film substrate (6) drew out the electrode of a trembler (1b) from the ink jet head (2), and it is connected to a drive circuit. While while consists of a free-machining ceramic and a vibration-deadening plate (1e) carries out adhesion immobilization of the field with vibrator (1b), adhesion immobilization of the field of another side is carried out with adhesives at the wall of a head frame (2a). the electrode of vibrator (1b) -- a film substrate (6) -- letting it pass -- about 30 -- by adjusting the electrical potential difference of V, vibrator (1b) carries out about 2-micrometer stretch shrinkage, and a diaphragm (1c) is vibrated through an island-like projection (1d). A diaphragm (1d) is 1st page which forms a pressure generating room (1f), changes the volume of a pressure generating room (1f), and makes ink breathe out using the pressure generated in that case, when a diaphragm vibrates.

[0013] The basic configuration of this example is explained below. As for the ink jet type recording apparatus of this example, the ink tank (3) of another object type is carried out of carriage, and ink is connected to the inlet (5d) of the damper (5) carried in carriage using the tube (4). An ink jet head (2) forms a record image in discharge and a record medium for an ink droplet, being fixed on carriage and making carriage reciprocate in the direction A of an arrow head. It is fixed to an ink jet head (2), and an absorber (5) reciprocates in the direction of the direction A of an arrow head with carriage. The absorber (5) consists of an absorber frame (5a), a flexible absorber film (5b), and a filter (5c). Derivation opening (5e) connected with the inlet (5d) and the supply pipe (2a) of an ink jet head (2) which are connected with an ink tube (4) is formed in the absorber frame (5a) with penetration opening. Derivation opening (5e) and a supply pipe (2a) mind a rubber bush (8), and the seal is connected and carried out. As a rubber bush (8) is shown in drawing 3 (a), L character-like passage is formed. The projection has appeared in the part into which derivation opening (5e) enters at the circumferencial direction, if derivation opening (5e) enters, a projection will be crushed, a seal will be taken and the leakage of ink will be prevented. The projection has appeared in the circumferencial direction and a seal is carried out also to the part into which a supply pipe (2a) enters similarly. It leads to the pressure absorption room (5f) which groove passage (5g) was formed in the damper frame (5a), and was formed in the damper frame (5a). From the pressure absorption room (5f), it passed through passage (5h) and has branched to two derivation openings (5e). Heat welding of the damper film (5b) which consists of a laminated film of flexible polyethylene or polyethylene, and nylon so that a pressure absorption room (5f) and passage (5g) may be covered is carried out at a damper frame (5a). Thereby, a pressure absorption room (5f) is sealed. The filter (5c) is attached between a pressure absorption room (5f) and passage (5h). This filter (5c) is made by weaving in the metal thin line of ink corrosion resistance in the shape of a mesh, and is incorporated by ultrasonic welding between the pressure absorption rooms (5f) and passage (5h) of a damper frame (5a). Derivation opening (5e) by the side of a pressure absorption room (5f) is connected with passage (5h) at an angle of theta 1 to the successive installation direction of a nozzle train. This damper (5) is manufactured with resin shaping of one body, considers the joining nature of a damper film, and is made from the product made from polyethylene. It cuts and lacks between derivation opening (5e) and derivation opening (5e), and it enables it to install the film substrate (6) and the circuit board (7) from a trembler (1b) in an ink jet head (2) perpendicularly to an ink jet head (2). Nozzles (1a) are 2 train configurations, and the ink jet head (2) of this example consists of two vibrator units. The circuit board (7) in which the drive circuit of vibrator (1b) was carried has composition of two sheets as a form where it became independent, respectively. There is a holder substrate (10) fixed by hook in an ink jet head (2), and the circuit board (7) is fixed to the both sides of a holder substrate.

[0014] An operation of a damper is explained with the flow of ink here. Ink passes a tube (4) from an ink tank (3), and goes into an inlet (5d). further -- an inlet (5d) to passage (5g) -- a passage -- a pressure absorption room (5f) -- entering. It branches from passage (5h) to two derivation openings (5e) through a pressure absorption room (5f) to a filter (5c) after that. Ink is led to a reservoir and a pressure generating room from a supply pipe (2a). Telescopic motion of vibrator (1b) raises the pressure of a pressure room here, and the regurgitation of the ink is carried out. Suction is carried out to early ink restoration from a nozzle with the aspirator which was carried out of carriage and which is not illustrated. It draws and fills up with ink from an ink tank (3) to a nozzle. At the time of printing, ink is supplied for ink from an ink tank (3) according to the return force of the meniscus in an after [the regurgitation] nozzle (1a). Here shows the mimetic diagram of arrangement of ink tank (3), tube (4), and carriage (9) ** to drawing 4. Carriage is reciprocating at the time of actual printing. For example, carriage moves rightward. Carriage moves and stops to a right end. if carriage starts migration leftward and moves to a left end after that -- there -- a halt -- it moves rightward again. Such migration is repeated and a record image is formed in a record medium. When stopping with the time of starting migration, acceleration occurs on carriage (9). The ink in a tube (4) is also carrying out migration and a

halt similarly to a motion of carriage (9), and a pressure will work in proportion to the acceleration of carriage (9) in ink. For example, when the carriage under migration leftward (9) moved and stops to a left end, ink will receive a pressure leftward and ink will be pushed in in an ink jet head (2). Ink flows into the pressure absorption room (5f) of a damper (5) so much. However, it is absorbed by compression of the air of a pressure absorption room (5f), and the swelling of a damper film (5b). Therefore, even when ink generates a pressure by the acceleration and deceleration of carriage (9), the regurgitation which could lose the effect of the meniscus on a nozzle and was stabilized is performed.

[0015] An effect of the invention is explained here. It connects with the supply pipe (2a) with which derivation opening (5e) had branched from passage (5h) to two, and the damper (5) of this example was formed in the head frame (2b) through the rubber bush (8). Therefore, since supply is made possible from one damper (5) to two supply pipes (2a) and it is manufactured with injection molding of one, there are few components mark. For shaping, neither internal passage (5g), nor an inlet (5d) and derivation opening (5e) has a knot, since it is made smoothly and is, air bubbles stagnate to the projection in passage etc., and does not wake up gas supply pressure failure, and really has very reliable structure (5h).

[0016] The effectiveness which formed derivation opening (5e) at an angle of theta 1 here is described. When the include angle theta 1 of derivation opening (5e) is formed at 0 times as the preceding clause explained, width of face of a damper (5) will be made on outside a supply pipe (2a). However, if theta 1 has an include angle, the joint of derivation opening (5e) and passage (5h) approaches inside, and can move inside at the partial pressure force absorption room. In the case of this example, the include angle theta 1 is formed at about 7 times, and has shifted the pressure absorption room (5f) to the about 4mm inside. Thereby, magnitude of carriage is made small. However, derivation opening (5e) is different in the passage die length from a filter (5c) to a supply pipe (2a) by right and left as it understands that I have drawing 3 (b) seen. As for right-hand side derivation opening (5e), only L1 is longer than left-hand side derivation opening (5e).

Therefore, the passage resistance from a filter (5c) to a supply pipe (2a) is different. An ink jet type recording apparatus attracts the ink in a nozzle (1a) with the aspirator which was installed out of carriage as cleaning of the nozzle (1a) section and which is not illustrated.

Moisture evaporates [the ink in a nozzle (1a)] with time amount progress, and ink thickens. The stable regurgitation cannot be performed in the thickened ink. Then, the ink thickened in the nozzle (1a) is attracted compulsorily, and the ink in a nozzle (1a) is made new. When passage resistance is different for every nozzle train, it becomes impossible however, to attract ink only from the low nozzle train of passage resistance. Inner ink thickens the nozzle with higher passage resistance (1a), and when the worst, it does not carry out the regurgitation of the ink. Then, by enlarging only the diameter of right-hand side derivation opening (5e), phase murder and passage resistance on either side are made the same for a part for the passage resistance produced with die length L1. The regurgitation stabilized by that cause is performed.

[0017] The effectiveness made the configuration which installs the circuit board (7) between derivation openings (5e) of a damper (5) is described. A film substrate (6) and the circuit board (7) are perpendicularly installed in the clearance between derivation opening (5e) and derivation opening (5e). Since there is no passage, such as distribution passage, in an ink jet frame center section, a film substrate (6) and the circuit board (8) can be perpendicularly arranged from a trembler (1b) on a straight line to an ink jet head. Therefore, the width of face of an ink jet head (2) will be decided by width of face of a head frame (2b), and serves as a compact ink jet head (2). This circuit board (7) is considered as a configuration called one per vibrator unit, and since it is using two vibrator units in the case of this example, it is using the circuit board (7) of two sheets. It is size with smaller dividing rather than it constitutes from one sheet, and ends, and since it has attached so that the two sheets may be piled up, the ink jet head is small.

[0018] Drawing 5 (a) is the side elevation showing one example of this invention. Drawing 5 (b) is the sectional view showing the passage. In drawing 5, the damper (50) forms the pressure absorption room (50c) in both sides. An inlet (50a) and derivation opening (50e) are prepared independently to each pressure absorption room (50c). That is, the ink into which it went is left from left-hand side derivation opening (50e) through a left-hand side pressure absorption room (50f) from a left-hand side inlet (50a). Therefore, it has composition which supplies the ink which is different to two supply pipes, respectively with a damper frame (50f). Ink is taken in from the inlet (50a) of the damper (50) back end, and is in a pressure absorption room (50c) through passage (50b). Passage (50d) and derivation opening (50e) are passed from here, and an ink jet head (2) is supplied. It is possible for the ink jet head (2) to consist of nozzle trains of two trains in this example, and for the supply pipe to be formed independently to each nozzle train, and to treat two kinds of ink in one ink jet (2). It is enabled to form derivation opening (50e) at an angle of theta 2 to the direction of a nozzle train, and to form a pressure absorption room (50c) inside here. Therefore, the width of face of this absorber (50) that can deal with two kinds of ink can be dedicated within the width of face of an ink jet head (2). Therefore, the width of face of an ink jet head (2) is stopped, and a miniaturization, as a result the body of a recording device can be miniaturized for carriage. Moreover, the absorber (50) which can carry out independently pressure absorption of this two ink, respectively can be used, and it can also be used, being able to connect with two ink jet heads, and leads also to reduction of components mark.

[0019]

[Effect of the Invention] The ink-jet type recording device of this invention is characterized by to be characterized by to carry the pressure absorber which serves as an ink-jet head from a pressure absorption frame and the flexible pressure absorption film in said carriage, and for there to be two or more derivation openings of said pressure absorber, and to install the circuit board in the perpendicular direction of an ink-jet head in the ink-jet type recording device which carriage is made to reciprocate in the direction which crosses a record medium for an ink droplet with discharge from a nozzle plate, and forms a record image in it at a record medium. Thereby, a reliable damper is realizable compactly. Furthermore, the circuit board could be installed in the perpendicular direction of an ink jet type recording head, and it made it possible to constitute an ink jet type recording head in a compact. The miniaturization of the body of a recording device also makes implementation possible by this.

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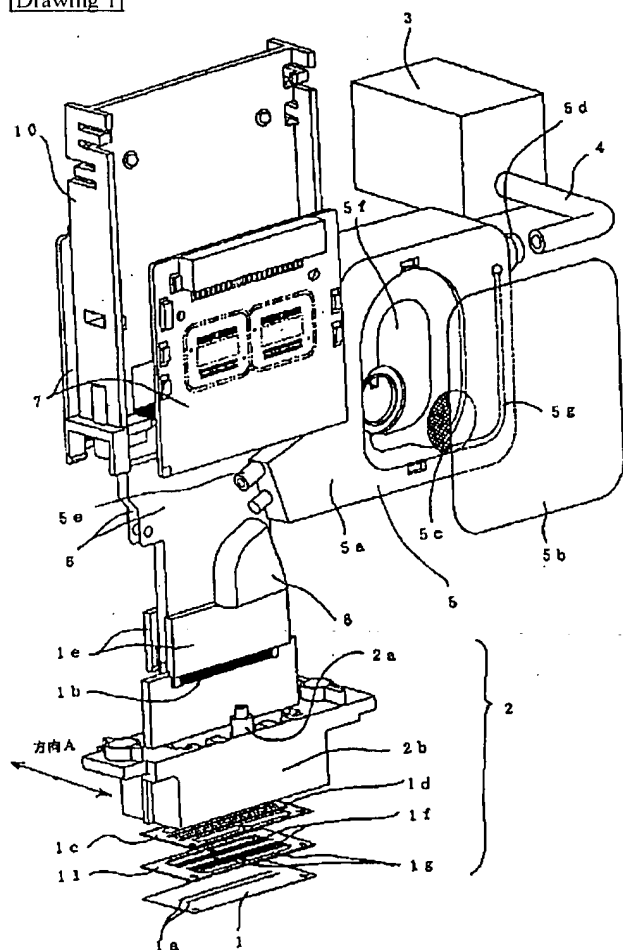
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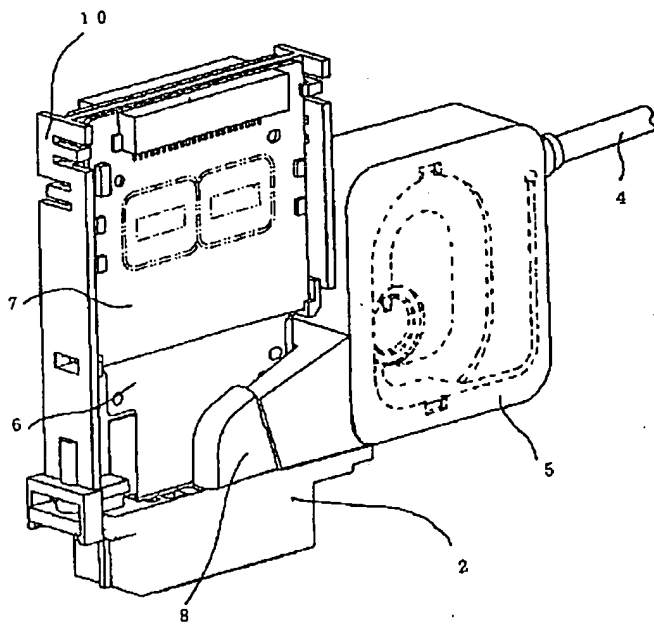
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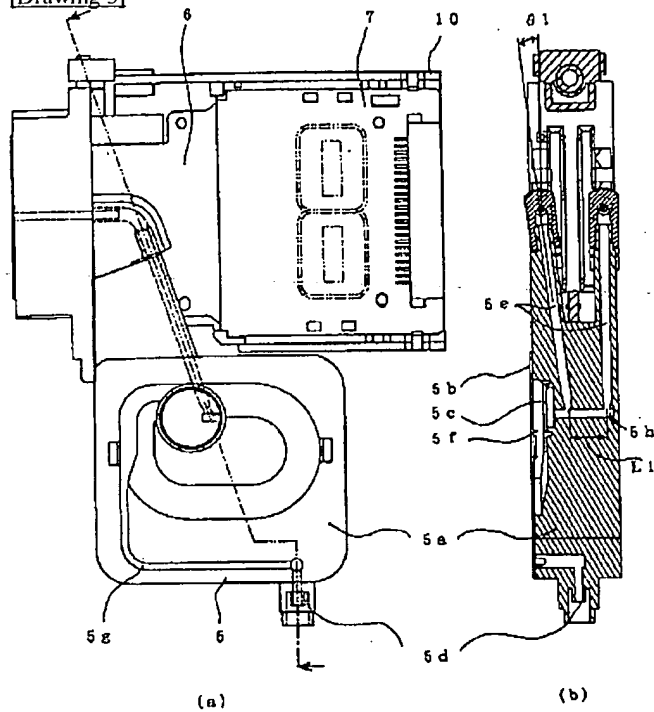
[Drawing 1]



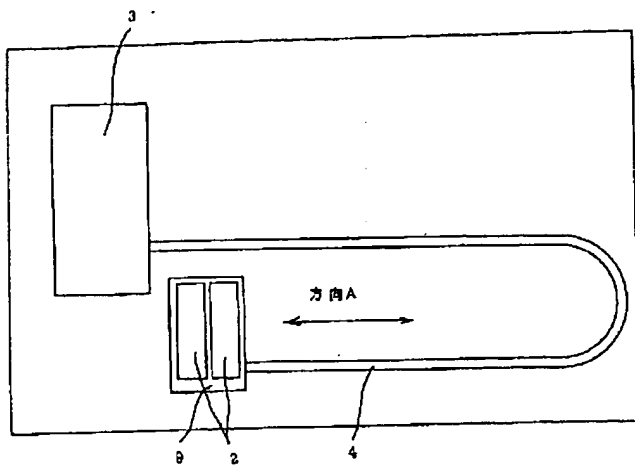
[Drawing 2]



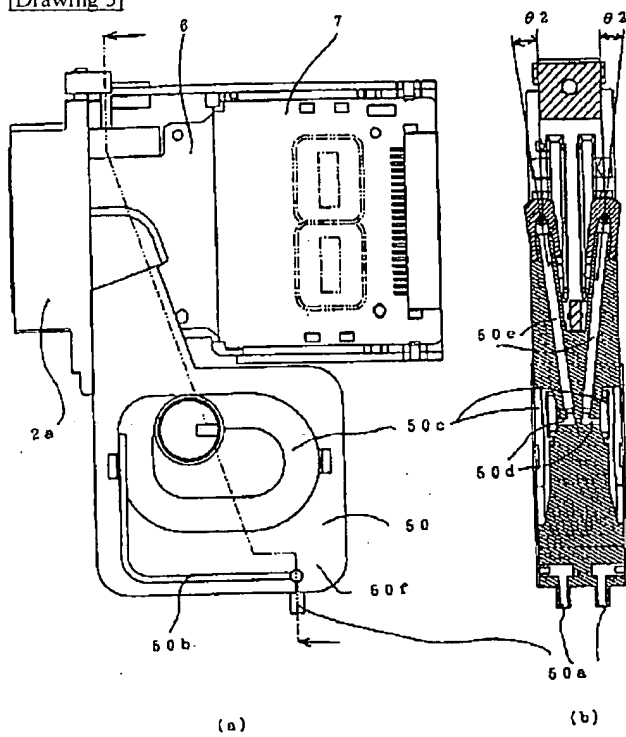
[Drawing 3]



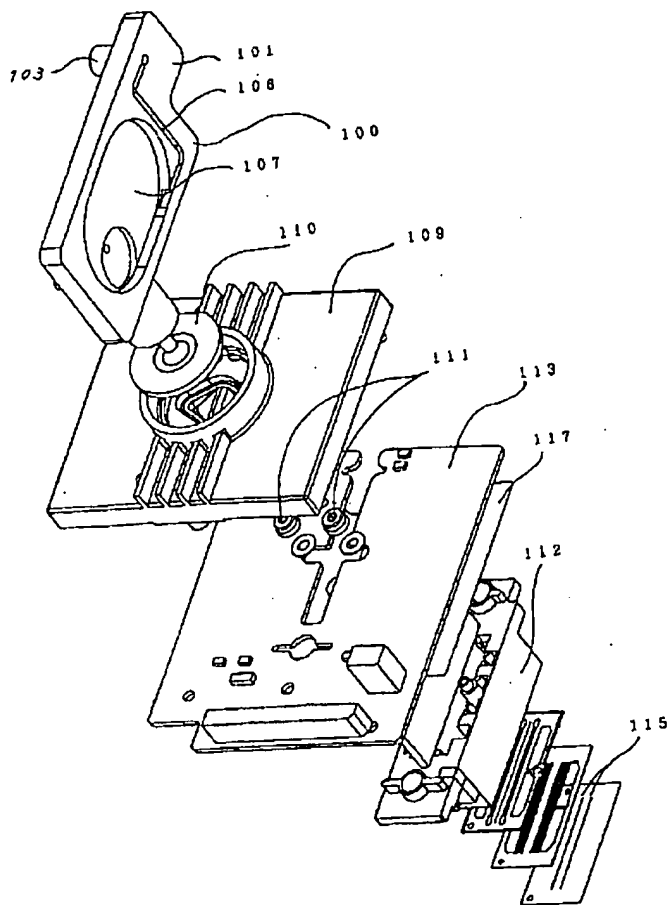
[Drawing 4]



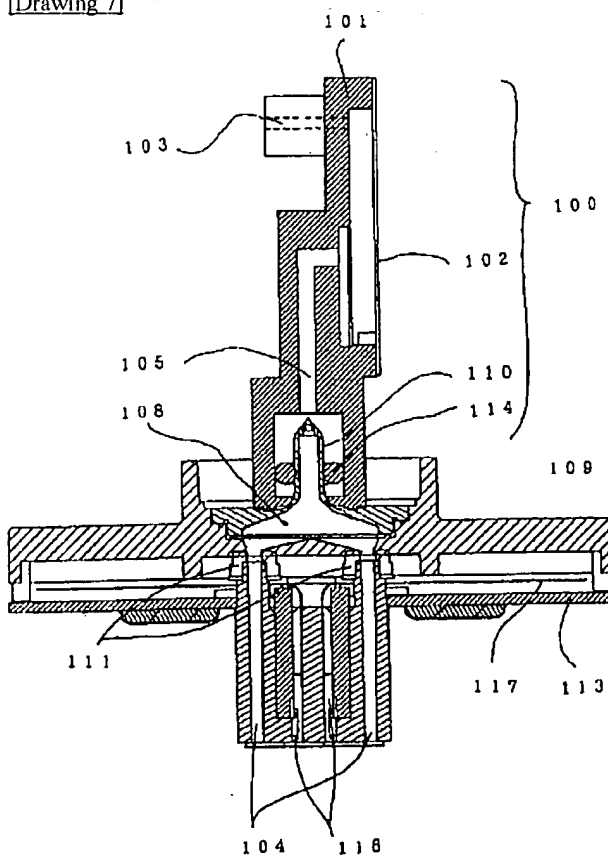
[Drawing 5]



[Drawing 6]



[Drawing 7]



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